

### **Remarks**

Applicants respectfully request reconsideration of the present application in view of the foregoing amendments and the following remarks. Claims 1, 2, 7-10 and 26-44 are pending in the application. Claims 1, 2, 7-10 are rejected. No claims have been allowed. Claims 3-6 and 11-25 are herein cancelled without prejudice. Claims 26-44 are new. Claims 1, 7, 29, 33, 37, and 44 are independent. Claims 1 and 7 have been amended.

### ***Cited Art***

The Action cites:

Wu, U.S. Patent No. 7,032,217 (hereinafter “Wu”),

Chilimbi et al., Dynamic Hot Data Stream Prefetching for General-Purpose Programs (hereinafter “Chilimbi”),

Alexander, U.S. Patent No. 6,658,652 (hereinafter “Alexander”), and

Zorn et al., A Memory Allocation Profiler for C and Lisp Programs (hereinafter “Zorn”)

### ***Amendments to the Claims***

Applicants have amended the claims to reflect claim amendments proposed during telephonic interviews with Examiner Wei in November, 2008. As discussed in the interviews, the claims are supported in the Application, for example in the portions of the Application quoted below as well as at originally filed claim 2, page 14, line 25 to page 15, line 2, and page 9, lines 8-16. No new matter is added.

### ***Request for Information Disclosure Statement to be Reviewed***

Applicants note that the Action does not include an initialed copy of the Form 1449 which accompanied an Information Disclosure Statement filed on October 30, 2008. Applicants request the Examiner provide an initialed copy of the Form 1449.

### ***Double Patenting Rejection over U.S. Pat. No. 7,140,008 in view of Chilimbi***

The Action rejects claim 1 under nonstatutory obviousness-type double patenting as being unpatentable over claim 1 of U.S. Patent No. 7,140,008 (hereinafter “the ‘008 patent”) in

view of Chilimbi. Applicants respectfully traverse and submit the claims, as amended, are patently distinct over the cited art. The '008 patent, even taken in view of Chilimbi, still fails to teach or suggest all limitations of claim 1.

As Applicants have discussed previously, instant claim 1 is directed at least in part to adjusting sampling rates. For example, claim 1 recites:

*adapting the sampling rate for the code paths according to the frequency of execution of the code paths, such that, after adapting, a ratio of a number of executions of the instrumented version code path to a total number of executions of the code path is equivalent to the adapted sampling rate, wherein the sampling rate for executing the code paths is adapted such that the adapted sampling rate is inversely related to the frequency of execution of the code paths.*

[Emphasis added.] Examples of sampling rates, and how they are adjusted, are found in the Application, for example starting at page 6:

In bursty tracing with adaptive instrumentation, *this sampling rate is adapted to the frequency of execution of the code path through the adaptive dispatch check. The more often the code path (i.e., the adaptive dispatch check) is executed, the more the sampling rate is decreased.* In one implementation, all adaptive dispatch checks initially produce bursty trace samples at a rate at or near 100% (full tracing). . . .

[ ]For example, in one implementation, the sampling rate is decremented by a factor of 10 each time the sampling rate is decreased, e.g., from 100%, 10%, 1%, 0.1%, etc. The interval determines how often to decrement the sampling rate. In one implementation, the sampling rate is decremented progressively less often. For example, the interval between decrements can be increased by a factor of 10 each time the sampling rate is decremented, e.g., from an interval of 10 nCheck counter resets, to 100, 1000, 10,000, etc. The bound counter determines the lower bound of the sampling rate for the adaptive dispatch check.

In each case, the Action cites either "tracking a number of iterations" or "the tracked number of iterations."

[Application, at page 6, line 3 to page 8, line 5; emphasis added.] Hence, the claims recite *changing* rates of sampling.

In the previous Action filed July 21, 2008, Applicants argued that the '008 patent could not teach or suggest the above-quoted language of claim 1 because its sampling rate could not change. [See, Applicant's Amendment filed July 21, 2008, at page 10.] The Action appears to agree with this argument, as it withdraws the double patenting rejection over the '008 patent. [Action, at § 8, page 3.] However, the Action presents a new ground of double patenting, rejecting the claims over the '008 patent in view of Chilimbi. In its rejection, the Action argues:

[Claim 1] of the instant application contains every element of Claim 1 of [the '008] patent as shown in the table below. The only difference is that the switch of the execution between the instrumented version and original version code path or procedure [is based on] a sampling rate while the claim 1 of the patent [is switched] according to the count parameter.

However, Cilimbi in the same analogous art of bursty tracing discloses using sampling rate to reduce the overhead of profiling (see for example Figure 2; p. 201, left column . . . ).

[Action, at § 10, pages 5-6.]

*Applicants respectfully note that the Action is mistaken in its argument about the differences between claim 1 of the '008 patent and claim 1 of the instant application, as discussed in the July 21, 2008 Amendment, as the '008 patent also does not teach or suggest "adapting the sampling rate" as recited in claim 1. In the Action's rejection of the above-quoted language of claim 1, it cites to the following language from claim 1:*

*alternately tracking a number of iterations of the check code executed in a checking phase and a profiling phase up to respective checking and profiling count parameters, . . . and switching between checking and profiling phases upon the tracked number of iterations of the check code reaching the respective count parameter of the respective phase.*

[Action, at § 11, page 9.]

Applicants first note that, as discussed in the Amendment of July 21, 2008, claim 1 of the '008 patent recites switching between checking and profiling based entirely on count parameters. Therefore, it is these count parameters in the '008 patent that define this ratio. As discussed previously, for a checking count parameter of 5 and a profiling count parameter of 3, the method of claim 1 of the '008 patent would necessarily switch to profiling after 5 iterations and back to checking after 3 more. This would define a profiling ratio of 5/8. Thus, any analog in the '008 patent to the "sampling rate" would be defined by the values of these count parameters.

Applicants respectfully argue that, contrary to the position taken in the Action, instant claim 1 and claim 1 of the '008 patent are not only different because of the use of sampling rates, but also because the '008 patent does not teach or suggest "adapting the sampling rate" as recited in instant claim 1. As Applicants have previously argued, the rate at which sampling is done in claim 1 of the '008 patent does not change. The '008 patent makes no mention of changing either count parameter in claim 1. As such, the count parameters are not described as changing, and therefore the rate defined by them is not described as changing either. Applicants

also continue to note argue that because the ratio is unchanging, claim 1 of the '008 patent teaches away from adjusting it as well.

Therefore, claim 1 of the '008 patent does not read upon, teach, or suggest, the above-quoted "adjusting the sampling rate" language of instant claim 1. However, despite this fact, the Action does not address or discuss this difference. Applicants therefore respectfully argue that the argument made in the Action that "[t]he only difference is that the switch of the execution between the instrumented version and original version code path or procedure [is based on] a sampling rate" is incorrect. Instead, at least part of the difference is based on "adapting the sampling rate," and this is not shown in claim 1 of the '008 patent.

*Chilimbi cannot remedy this shortcoming of the '008 patent by teaching or suggesting "adapting the sampling rate" as recited in instant claim 1 because Chilimbi teaches, at most, the use of a sampling rate, rather than "adapting the sampling rate."* The Action cites to a portion of the left column of page 201, Section 2.1 of Chilimbi for the "sampling rate" language of instant claim 1. However, while this language mentions "sampling" at only the most basic level:

Our framework must collect a temporal data reference profile with low overhead, because the slow-down from profiling has to be recovered by the speed-up from optimization. *A common way to reduce the overhead of profiling is sampling: instead of recording all data references, sample a small, but representative fraction of them.* Our profiler obtains a temporal profile with low overhead by sampling bursts of data references, which are subsequences of the reference trace.

[Chilimbi, at § 2.1, page 201, left column; emphasis added.] As the paragraph shows, while this portion of Chilimbi *introduces the idea of sampling*, it gets into no greater detail than to say that profiling occurs at a particular "fraction." While this may or may not be read upon by the "sampling rate" language of instant claim 1, *there is no indication given in this passage of changing or adapting this fraction or any other sampling rate.* As such, Applicants cannot see how the "adapting the sampling rate" language of claim 1 could read upon the cited portion of Chilimbi. Applicants also do not find further relevant disclosure in Chilimbi.

For at least these reasons, claim 1 is not obvious over claim 1 of the '008 patent, even when taken in view of Chilimbi. Applicants respectfully request that the double patenting rejection of claim 1 over claim 1 of the '008 patent be withdrawn and that the claim be allowed.

***Double Patenting Rejection over U.S. Pat. App. No. 10/892,260 in view of Chilimbi***

The Action provisionally rejects claim 1 under nonstatutory obviousness-type double patenting as being unpatentable over claims of co-pending Application No. 10/892,260 in view of Chilimbi. While Applicants respectfully disagree submit the claims, as amended, are patently distinct over the cited art, in the interest of expediting prosecution, Applicants submit a Terminal Disclaimer herewith over patents issuing from U.S. Patent App. No. 10/892,260.

***Claim Rejections under 35 U.S.C. § 112***

The Action rejected claims 12 and 18-22 under 35 USC § 112, second paragraph. With the instant amendment, previously-filed claims 12 and 18-22 have been cancelled without prejudice. The rejection is therefore moot.

***Patentability of Claims 1, 2 and 26-28 under 35 U.S.C. § 103(a)***

The Action rejects claims 1 and 2 under 35 U.S.C. § 103(a) as unpatentable over Wu in view of Chilimbi. Applicants respectfully submit the claims in their present form are allowable over the cited art. Wu and Chilimbi, taken either separately or in combination, fail to teach or suggest all limitations of the claims. Claim 1 is independent.

Claim 1, as amended, recites:

*adapting the sampling rate for the code paths according to the frequency of execution of the code paths, such that, after adapting, a ratio of a number of executions of the instrumented version code path to a total number of executions of the code path is equivalent to the adapted sampling rate, wherein the sampling rate for executing the code paths is adapted such that the adapted sampling rate is inversely related to the frequency of execution of the code paths.*

[Emphasis added.] As discussed above, examples of sampling rates, and how they are adjusted, are found in the Application, for example starting at page 6:

In bursty tracing with adaptive instrumentation, *this sampling rate is adapted to the frequency of execution of the code path through the adaptive dispatch check. The more often the code path (i.e., the adaptive dispatch check) is executed, the more the sampling rate is decreased.* In one implementation, all adaptive dispatch checks initially produce bursty trace samples at a rate at or near 100% (full tracing). . . .

[ ]For example, in one implementation, the sampling rate is decremented by a factor of 10 each time the sampling rate is decreased, e.g., from 100%, 10%,

1%, 0.1%, etc. The interval determines how often to decrement the sampling rate. In one implementation, the sampling rate is decremented progressively less often. For example, the interval between decrements can be increased by a factor of 10 each time the sampling rate is decremented, e.g., from an interval of 10 nCheck counter resets, to 100, 1000, 10,000, etc. The bound counter determines the lower bound of the sampling rate for the adaptive dispatch check.

In each case, the Action cites either “tracking a number of iterations” or “the tracked number of iterations.”

[Application, at page 6, line 3 to page 8, line 5; emphasis added.]

*Wu cannot teach or suggest “adapting the sampling rate” as recited in claim 1.*

Similarly to the double patenting rejection discussed above, in its rejection of claim 1, the Action repeats its argument that Wu teaches “adapting the sampling rate,” citing to Figures 5A and 5B of Wu. [Action, at § 17, page 16.] However, as discussed previously, *Wu cannot teach or suggest adapting sampling rate for code paths because Wu only checks if an execution edge is profiled after it is already executed.* Figures 5A and 5B of Wu, which are cited in the rejection of claim 1, each perform a “Was profiling instruction executed?” decision step. [See, Wu, at Figures 5A, step 510 and 5B, step 560.] As the language accompanying these steps makes clear, this no control is made over whether a step is a profiled step or not. For example:

Flow continues to decision block 510. If a profiling instruction is executed, flow continues to processing block 515. If the profiling instruction is not executed, flow loops back to decision block 510, until a profiling instruction is executed. Once a profiling instruction is executed, the profile counters are updated at processing block 515.

[Wu, at column 8, lines 58-63, describing Figure 5.] A similar passage can be found describing Figure 5B. As such Wu is clear that it only observes whether profiling instructions are executed and does not change code paths in the middle of execution. Indeed, Wu would not have alternative code paths to switch between, as it does not create duplicate code paths.

Figures 5A and 5B do, as the Action notes, utilize various counters to determine frequency of code execution. [See, Action, at § 17, page 16.] However, as Wu makes clear, these counters are implemented in hardware to gain profile information and to determine when a profile phase transition should occur:

The profiling hardware 400 signals a profile phase transition by generating an interrupt when the pir.trigger\_counter reaches zero.

[Wu, at column 8, lines 30-32.] The phase transition, however, does not modify the execution of the profiled program by adapting a sampling rate between the code paths. Rather it causes a complete re-optimization of the program itself:

Flow continues to decision block 530, where *if trigger\_counter reaches zero, an interrupt is generated at processing block 535 which signals a phase transition*. Flow continues to processing block 540 where new phase transition information is generated. *At processing block 545, the dynamic optimizer may take over and use the new edge profile information to re-optimize the program*. Flow then returns to start block 501.

[Wu, at column 9, lines 15-20.] Thus, while the program may be re-optimized, Wu clearly describes this re-optimization as the result of the tripping of the trigger\_counter, and rather than an adaptation of a sampling rate between non-existent alternative code paths. Applicants also do not believe that the Action's suggested modification of Wu, which would determine a rate based on profile information, would suffice to teach or suggest the above language of claim 1, as it once again simply provides for a re-optimization trigger and does not create or utilize duplicate code paths.

*Combination with Chilimbi does not remedy this shortcoming, either.* As discussed above in the response to the Action's double patenting rejection over claim 1 of the '008 patent, Chilimbi discusses only profiling at a "fraction" and does not discuss changing this fraction. As such, Chilimbi cannot teach or suggest the "adapting the sampling rate" language of claim 1.

For at least these reasons, Wu and Chilimbi, taken either separately or in combination, do not teach or suggest at least the above-quoted language of claim 1. Claim 1, as well as dependent claim 2 and new dependent claims 26-28, which depend from claim 1, are thus allowable and Applicants request their allowance. Applicants will not belabor the merits of the separate patentability of dependent claims 2 and 26-28.

#### ***Patentability of Claims 7-10 under 35 U.S.C. § 103(a)***

The Action rejects claims 7-10 under 35 U.S.C § 103(a) as unpatentable over Wu in view of Chilimbi and further in view of Alexander. Applicants respectfully submit the claims in their present form are allowable over the cited art. Wu, Chilimbi, and Alexander, taken either separately or in combination, fail to teach or suggest all limitations of the claims. Claim 7 is independent.

Claim 7 recites:

tracking frequency of execution of the procedures, *wherein the instrumented copy version of the procedures are sampled at rates adjusted to be inversely related to the frequency of execution of the procedures*, including: sampling at higher rates for the procedures whose total number of executions of both the original versions and the copy versions are executed less frequently, and sampling at lower rates for procedures whose total number of execution of both the original versions and the copy versions are executed more frequently . . .

[Emphasis added.] In its rejection of claim 7, the Action cites to similar passages of Wu as in the rejection of claim 1. [See, Action at § 18, page 27.] Thus, for at least the reasons discussed above with respect to claim 1, Wu and Chilimbi, taken separately or in combination, do not teach or suggest at least the above-emphasized language of claim 7. Applicants further do not find relevant disclosure in Alexander, which is focused on detection of memory leaks in object-oriented environments through particular storage of execution metrics. Therefore, Wu, Chilimbi, and Alexander, taken either separately or in combination, do not teach or suggest at least one element of claim 7. Claim 7, as well as dependent claims 8-10, which depend from claim 7, are thus allowable and applicants request its allowance. Applicants will not belabor the merits of the separate patentability of dependent claims 8-10.

***Patentability of Claims 29-44 under 35 U.S.C. § 103(a)***

New claims 29-44 each recite language similar to that of claims 1 or 7. For example, independent claims 29 and 37 each recite:

adapting the sampling rate for the code paths according to the frequency of execution of the code paths, such that, after adapting, the ratio of a number of executions of the instrumented version code path to a total number of executions of the code path is equivalent to the adapted sampling rate, wherein the sampling rate for executing the code paths are adapted at a rate inversely related to the frequency of execution of the code paths . . .

And new independent claims 33 and 41 each recite:

tracking frequency of execution of the procedures, wherein the instrumented copy version of the procedures are sampled at rates adjusted to be inversely related to the frequency of execution of the procedures, including: sampling at higher rates for the procedures whose total number of executions of both the original versions and the copy versions are executed less frequently, and sampling at lower rates for procedures whose total number of execution of both the original versions and the copy versions are executed more frequently . . .



Thus, for at least the reasons discussed above with respect to claims 1 and 7, Wu, Chilimbi, and Alexander, taken separately or in combination, do not teach or suggest at least the above-emphasized language of new independent claims 29, 33, 37, and 41. Claims 29, 33, 37, and 41, as well as dependent claims 30-32, 34-36, 38-40, and 42-44, each of which depend from claim 29, 33, 37, and 41, are thus allowable and applicants request its allowance. Applicants will not belabor the merits of the separate patentability of dependent claims 30-32, 34-36, 38-40, and 42-44.

### ***Interview Request***

If the claims are not found by the Examiner to be allowable, the Examiner is requested to call the undersigned attorney to set up an interview to discuss this application.

### ***Conclusion***

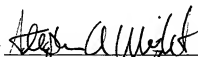
The claims in their present form should be allowable. Such action is respectfully requested.

Respectfully submitted,

KLARQUIST SPARKMAN, LLP

One World Trade Center, Suite 1600  
121 S.W. Salmon Street  
Portland, Oregon 97204  
Telephone: (503) 595-5300  
Facsimile: (503) 595-5301

By

  
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Stephen A. Wight  
Registration No. 37,759